

Attorney Docket No.: 02SPE130P

In the Claims:

Claim 1 (currently amended): A method for fabricating a damascene interconnect structure having one or more air trenches and a plurality of spaced-apart metal lines comprising:

(a) fabricating the damascene structure to a via level through a processing step prior to forming contact vias, wherein step (a) comprises:

depositing a first dielectric layer;

depositing a first capping layer over the first dielectric layer; and

forming a plurality of trenches in the first capping layer and the first dielectric layer;

filling the plurality of trenches with metal to form the plurality of spaced-apart metal lines, wherein the plurality of spaced-apart metal lines are situated in the first capping layer and the first dielectric layer; and

depositing a second capping layer directly on the first capping layer;

(b) etching one or more air trenches into the damascene structure so that the air trenches are positioned between selected metal lines, wherein the second capping layer is situated over the selected metal lines; and

(c) depositing a sealing layer over the damascene structure having air trenches to seal the air trenches.

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Claim 2 (previously presented): The method of claim 1, wherein step (a) further includes:

depositing a second dielectric layer over the second capping layer; and
depositing a third capping layer over the second dielectric layer.

Claim 3 (original): The method of claim 2, further including:

etching an air trench in the first and second dielectric layers, and the first, second and third capping layers.

Claim 4 (original): The method of claim 1, further including:

forming a via in the sealing layer and the damascene structure; forming a metal plug in the via;
forming a trench over the sealing layer; and forming a conductive layer in the trench.

Claim 5 (original): The method of claim 1, further including:

depositing an etch stop layer over the sealing layer;
forming a via in the etch stop layer, the sealing layer and the damascene structure;
forming a metal plug in the via;
forming a trench over the etch stop layer; and forming a conductive layer in the trench.

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Claim 6 (original): The method of claim 1, further including:

forming a via in the sealing layer;

forming a trench over the sealing layer;

forming a via in the damascene structure; and forming a conductive layer in the trench.

Claim 7 (original): The method of claim 1, further including:

forming a trench over the sealing layer;

forming a via in the sealing layer and the damascene structure; and forming a conductive layer in the trench.

Claim 8 (original): The method of claim 1, further including:

forming a via in the sealing layer and the damascene structure; forming a trench over the sealing layer; and forming a conductive layer in the trench.

Claims 9-20 (cancelled).

Claim 21 (currently amended): A method for fabricating a damascene interconnect structure having one or more air trenches and a plurality of spaced-apart metal lines comprising:

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(a) fabricating the damascene structure to a via level through a processing step prior to forming contact vias[;], wherein step (a) comprises:

depositing a first dielectric layer;

depositing a first capping layer over the first dielectric layer;

forming a plurality of trenches in the first capping layer and the first dielectric layer;

filling the plurality of trenches with metal to form the plurality of spaced-apart metal lines, wherein the plurality of spaced-apart metal lines are situated in the first capping layer and the first dielectric layer; and

depositing a second capping layer directly on the first capping layer and over the plurality of spaced-apart metal lines;

(b) etching one or more air trenches into the damascene structure so that the air trenches are positioned between selected metal lines;

(c) depositing a sealing layer over the damascene structure having air trenches to seal the air trenches;

(d) depositing a polish stop layer over the sealing layer; and

(e) depositing an etch stop layer directly on the polish stop layer.

Claim 22 (currently amended): The method of claim 21, wherein step (a) further includes:

~~depositing a first dielectric layer;~~

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depositing a first capping layer over the first dielectric layer;
depositing a second capping layer over the first capping layer;
depositing a second dielectric layer over the second capping layer; and depositing
a third capping layer over the second dielectric layer.

Claim 23 (previously presented): The method of claim 22, further including:
etching an air trench in the first and second dielectric layers, and the first, second
and third capping layers.

Claim 24 (previously presented): The method of claim 21, further including:
forming a via in the sealing layer and the damascene structure; forming a
metal plug in the via;
forming a trench over the sealing layer; and forming a conductive layer in the
trench.

Claim 25 (previously presented): The method of claim 21, further including:
forming a via in the etch stop layer, the sealing layer and the damascene structure;
forming a metal plug in the via;
forming a trench over the etch stop layer; and forming a conductive layer in the
trench.

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Claim 26 (previously presented): The method of claim 21, further including:

forming a via in the sealing layer;

forming a trench over the sealing layer;

forming a via in the damascene structure; and forming a conductive layer in the trench.

Claim 27 (previously presented): The method of claim 21, further including:

forming a trench over the sealing layer;

forming a via in the sealing layer and the damascene structure; and forming a conductive layer in the trench.

Claim 28 (previously presented): The method of claim 21, further including:

forming a via in the sealing layer and the damascene structure; forming a trench over the sealing layer; and forming a conductive layer in the trench.

Claim 29 (currently amended): A method for fabricating a damascene interconnect structure having one or more air trenches and a plurality of spaced-apart metal lines comprising:

(a) fabricating the damascene structure to a via level through a processing step prior to forming contact vias, wherein step (a) comprises:

depositing a first dielectric layer;

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depositing a first capping layer over the first dielectric layer;

forming a plurality of trenches in the first capping layer and the first dielectric layer;

filling the plurality of trenches with metal to form the plurality of spaced-apart metal lines, wherein the plurality of spaced-apart metal lines are situated in the first capping layer and the first dielectric layer;

depositing a second capping layer ~~over~~^{directly on} the first capping layer and over the plurality of spaced-apart metal lines;

depositing a second dielectric layer over the second capping layer; and

depositing a third capping layer over the second dielectric layer;

(b) etching one or more air trenches into the damascene structure so that the air trenches are positioned between selected metal lines;

(c) depositing a sealing layer over the damascene structure having air trenches to seal the air trenches; and

(d) depositing a polish stop layer over the sealing layer.

Claim 30 (previously presented): The method of claim 29, further including:
etching an air trench in the first and second dielectric layers, and the first, second and third capping layers.